Japanese Utility Model Gazette
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A. Relevance of the Above-identified Document

The following is a partial English translation of exemplary portions of non-English language information that may be relevant to the issue of patentability of the claims of the present application.

B. Translation of the Relevant Passages of the Document

[Claims]

A reinforcing structure in which (i) a reinforcing member is bonded with one surface of a flexible circuit board, so that said flexible circuit board is reinforced, and (ii) an edge portion of said reinforcing member serves as a bending portion of the flexible circuit, said structure characterized in that:

said reinforcing member is made of plural thin plates which are laminated in such a manner that a lamination thickness of said reinforcing member is reduced in a direction towards said bending portion.

[DETAILED DESCRIPTION OF THE UTILITY MODEL]

[INDUSTRIAL FIELD OF THE UTILITY MODEL]

The present utility model relates to a reinforcing

structure for a flexible circuit board, and is particularly related to a reinforcing structure for a flexible circuit board, which structure prevents discontinuation of wiring due to an excessive stress applied to the circuit when the flexible circuit board is bent at an edge portion of a reinforcing member.

[PRIOR ART]

A flexible circuit board is widely used in cameras, watches, and other electronics applied devices or the like. In such a flexible circuit board, a reinforcing member is sometimes bonded as needed, in accordance with a mounting condition, so as to obtain a needed strength. A specific structure is as follows. Namely, as illustrated in Fig. 3, in a conventional flexible circuit board 3, a conductor 2 is provided as a pattern or the like, on one surface of a flexible base member 1. On this flexible circuit board 3, a hard reinforcing member 5 is bonded via an adhesive layer 4 on another surface opposing to the surface on which the conductor 2 is formed.

[PROBLEMS TO BE SOLVED BY THE UTILITY MODEL]

In this conventional structure, however, bending of the flexible circuit board 3 at the edge portion of the reinforcing member 5 (i.e. bending at the portion indicated by the arrow in the same figure) causes the conductor 2 to

be discontinued or folded due to an unwanted stress applied to the conductor 2. This is attributed to an extreme strength differential between the hard reinforcing member 5 and the soft flexible circuit board 3 at the bending boundary portion, and a stress occurring due to the bending motion of the flexible circuit board 3 is always concentrated at the boundary, thus causing fatigue of the flexible circuit board 3.

[MEANS TO SOLVE THE PROBLEM]

In view of the foregoing problem, the present invention is made. In order to solve the problem, the present invention is a reinforcing structure in which (i) a reinforcing member is bonded with one surface of a flexible circuit board, so that said flexible circuit board is reinforced, and (ii) an edge portion of said reinforcing member serves as a bending portion of the flexible circuit, said structure characterized in that: said reinforcing member is made of plural thin plates which are laminated in such a manner that a lamination thickness of said reinforcing member is reduced in a direction towards said bending portion.

[EFFECTS]

The above described means yield gradual change of a stress, because a stress is dispersed within the bent

portion. Hence, conductor at the bent portion of the flexible circuit board is kept from being damaged.

[EMBODIMENT]

Fig. 1 illustrates an embodiment of the present invention. In a flexible circuit board 3, a circuit pattern or the like of a conductor 2 is formed by using a copper foil or the like, on one surface of base member 1 which is made of insulative film of polyimide, polyamide or the like. Meanwhile, plural thin plates 7 are overlapped one another, interposing therebetween adhesive layer 6 which is an adhesive agent or bond, and these plural thin plates 7 to serve as a reinforcing member are pasted to the flexible circuit board 3. For example, each of the thin plates 7 can be a plastic film or a metal film, and is laminated in such a manner that the lamination thickness is reduced in the direction towards a portion of the flexible circuit board 3, in which portion bending occurs.

This structure allows the flexible circuit board 3 to be bent along with the thin plates 7 as illustrated in Fig. 1 (B), forming a gentle curve. Thus, concentration of stress in the bent portion is avoided, and the damaging of the conductor 2 is suitably prevented.

Further, as illustrated in Fig. 2, the flexible circuit board 3 may be provided with a reinforcing member which is a lamination of thin plates 8 each made of a pre-preg

material such as glass epoxy, nonwoven glass fabric, polyester, or the like.

These kinds of resin are in so-called B-stage. As such, unlike the former example, lamination without a use of the adhesive layer 6 is possible. Therefore, the total thickness of the reinforcing member can be reduced even the number of laminations are the same. Thus, it is possible to realize more gradually and smoothly varying hardness of the reinforcing member, as compared with the former example.

[EFFECTS OF THE UTILITY MODEL]

With the present invention, bending of a flexible circuit board does not cause concentration of bending stress at an end portion of a reinforcing member. Thus, damaging of conductor at the portion is prevented, and the performance of the flexible circuit board can be stabilized for a long time.

[BRIEF DESCRIPTION OF DRAWINGS]

Fig. 1 is a cross sectional view schematically illustrating an exemplary reinforcing structure of the present Utility Model, for a flexible circuit board. (A) illustrates the circuit board yet to be bent, and (B) illustrates the circuit board being bent.

Fig. 2 is a cross sectional vie of schematically

illustrating another example.

Fig. 3 is a cross sectional view schematically illustrating a conventional reinforcing structure.

The reference numerals in the attached drawings are as follows.

1: Base Member

2: Conductor

3: Flexible Circuit Board

4: Adhesive Layer

5: Reinforcing Member

6: Adhesive Layer

7: Thin Plate

8: Thin Plate

⑫実用新案公報（Y2）　平2－23001

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H 05 K 1/02　D　8727－5E

（全2頁）

⑤4考案の名称　フレキシブル回路基板の補強構造

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⑤7実用新案登録請求の範囲

フレキシブル回路基板の一方の面に補強部材を接合して前記フレキシブル回路基板の補強を図ると共に前記補強部材の端部部位を前記フレキシブル回路基板の曲げ部としたフレキシブル回路基板の補強構造において、前記補強部材が、前記曲げ部に向うに従つて積層厚が減少するよう積層した複数枚の薄板から成ることを特徴とするフレキシブル回路基板の補強構造。

考案の詳細な説明

「産業上の利用分野」

本考案はフレキシブル回路基板の補強構造に関し、特には、補強部材の端部部位に於いてフレキシブル回路基板を曲げた際に回路パターンに無理な応力が加わり断線する事態を防止するようにしたフレキシブル回路基板の補強構造に関する。

「従来の技術」

カメラ、時計その他各種の電子応用機器等において広く使用されているフレキシブル回路基板は、実装条件に応じて補強部材を接合し必要な強度を付与する場合がある。即ち、その具体的構造としては、従来、第3図に示すように、可撓性のベース部材1の一方の面に導体2をパーン等として設けたフレキシブル回路基板3の導体2の形成面とは反対側の面に接着層4を介して硬質の補強部材5を接合している。

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「考案が解決しようとする問題点」

この従来構造においては、フレキシブル回路基板3を補強部材5の端部部位、即ち同図中矢印にて示す部分に於いて曲げた場合に、導体2が好ましくない応力を受けて折れたり断線することが多い。これは、硬質の補強部材5と柔軟なフレキシブル回路基板3との境界曲げ部に於いて強度の極端な差があり、フレキシブル回路基板3の屈曲運動による応力集中が常にその境界線上で起こり、疲労が生じる為である。

「問題点を解決するための手段」

本考案は叙上の問題を解決すべく為されたもので、その為に、本考案によれば、フレキシブル回路基板の一方の面に補強部材を接合して前記フレキシブル回路基板の補強を図ると共に前記補強部材の端部部位を前記フレキシブル回路基板の曲げ部としたフレキシブル回路基板の曲げ部としたフレキシブル回路基板の補強構造において、前記補強部材を、前記曲げ部に向うに従つて積層厚が減少するよう積層した複数枚の薄板から構成するようにしたものである。

「作用」

斯かる手段によれば、フレキシブル回路基板の曲げ部に於いて応力が分散されて連続的に変化し、その為、フレキシブル回路基板の前記曲げ部に於ける導体の折損が生じないようになる。

「実施例」

第1図は本考案の一実施例を示すもので、ポリイミド、ポリアミド等を素材とする絶縁性フイルムから成るベース部材1の一方の面に例えば銅箔から成る回路パターン等の導体2を形成して成るフレキシブル回路基板3に対し、接着剤又は粘着剤から成る接着層6を介して補強部材としての複数枚の薄板7が重合貼付けされる。薄板7は、プラスチックフイルム、金属箔等を利用でき、フレキシブル回路基板3の曲げが発生する部分に向うに従つて積層厚が減少するよう積層される。

このようにすると、フレキシブル回路基板3は同図Bに示すように、薄板7と共に緩やかに曲線を描いて曲がることとなり、その為、曲げ部に特定の曲げ応力が集中せず、導体2の折損を好適に防止できる。

また、第2図に示すように、フレキシブル回路基板3に対して、補強部材をガラスエポキシ、ガラス不織布、ポリエステル等のプリプレグ材料から成る薄板8を積層して形成することもできる。

即ち、これらの樹脂はいわゆるBステージにあるので最初の実施例に於けるような接着層6を使用せずに積層することが可能であり、その為、積

層数が同じでも、補強部材全体の厚みが小さくなり、従つて、補強部材の硬さを前述の実施例に比し、より連続的且つ滑らかに変化させることができる。

「考案の効果」

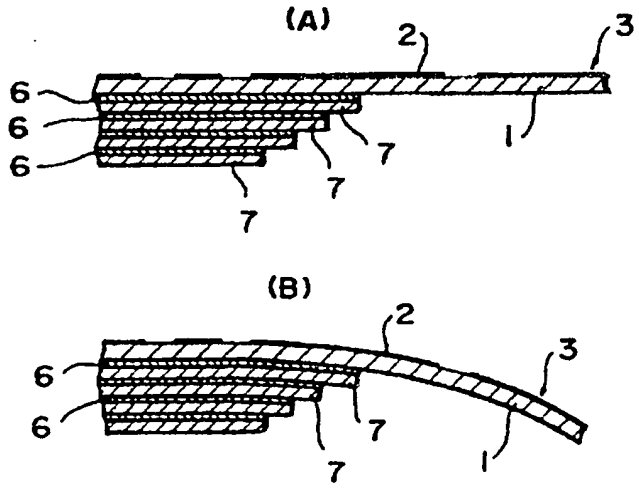
本考案によれば、フレキシブル回路基板が補強部材の端部部位に於いて曲げ応力の集中を伴つて曲がることがなく、その為、その曲げ部分に於ける導体の折損が生ぜず、従つて当該フレキシブル回路基板の動作を長期にわたつて安定化させることができる。

図面の簡単な説明

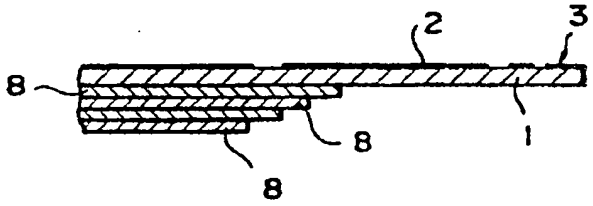
第1図は本考案に係るフレキシブル回路基板の補強構造の一実施例を概念的に示す断面図で、Aは同回路基板を曲げる前の状態を、Bは同回路基板を曲げた状態をそれぞれ示す図、第2図は他の実施例を概念的に示す断面図、第3図は従来の補強構造を概念的に示す断面図である。

添付図面に示す各符号の名称は、次のとおりである。1：ベース部材、2：導体、3：フレキシブル回路基板、4：接着層、5：補強部材、6：接着層、7：薄板、8：薄板。

第1図



第2図



第3図